BOOK REVIEWS

Hutchinson, J. The Families of Flowering Plants. II. Monocotyledons. London. MacMillan & Co., 1934., pp. x and 243, figs. 107. 20s. net.

The classification of the flowering plants is a subject of interest to the great majority of botanists. Of the innumerable schemes that have been put forward up to the present no one has achieved a general acceptance. The present volume forms the completion of the presentation of the new system devised by Dr. Hutchinson, the dicotyledons being dealt with in the first volume which appeared in 1926.

The present account of the monocotyledons follows the general plan adopted in the former volume, the orders are reduced in size and so become more numerous ; 29 orders of monocotyledons are recognised as compared with 7 in the system of Bentham and Hooker, and 11 in that of Engler and Prantl. The use of the more numerous and smaller orders makes the system at first sight unfamiliar, but many of the changes so introduced are minor ones.

In the system under review Dr. Hutchinson has essayed the task of propounding a scheme that represents the arrangement he regards as forming the phylogenetic development of the monocotyledons. He regards the group as quite definitely monophyletic and as derived from a dicotyledonous ancestor. In the first volume he considered the Ranales as the most primitive dicotyledon type and the monocotyledons are derived from the same source. Such families as the Alismataceae and Butomaceae are looked upon as the most primitive of the monocotyledons and the most nearly related to their Ranalean ancestors. These families already show differences that are regarded as of fundamental importance and which have led to two separate lines of progression in the monocotyledons. The two lines are separated on the form and differentiation of the perianth.

The first has a perianth of which the outer whorl is sepaloid and most often green, the inner may be petaloid or not. Even where both are petaloid they are separate and never united in one structure. This constitutes the subclass *Calyciferae.*

The second line has both whorls of perianth similarly developed, most commonly petaloid, and often united together. This is the subclass *Corolliferae.* A third subclass which is regarded as a development from the Corolliferae has the perianth very much reduced or absent and flowers specialised for wind pollination. These are the *Glumiflorae.*

The Calyciferae start from the Alismataceae, from which two lines of development have taken place. The one shows reduction in floral structure and aquatic habit with the extreme case in Naiadaceae. The other line comprises land plants and forms a series through Commelinaceae and Bromeliaceae, culminating in the Scitamineae, now termed Zingiberales. The Zingiberaceae are regarded as the highest development of the Calyciferae and as showing a parallelism in development with the Orchidaceae among the Corolliferae, but in no way really connected with them. The isolated families Xyridaceae and Eriocaulaceae represent the ends of less specialised lines in the Calyciferae.

The Corolliferae start from the Butomaceae and present a series of lines of development from the central type of the Liliaceae. From this central type one line has developed towards zygomorphism with its culmination in Orchidaceae. Another with crowded spicate inflorescences has developed through the Palms to Pandanaceae and Cyclanthaceae, which are looked upon as advanced specialised families.

The Araceae represent an individual line as also do Typhaceae. The last are not regarded as primitive or as nearly connected to Pandanaceae. Other lines have culminated in Iridaceae and in Amaryllidaceae, and, through Juncaceae, in Cyperaceae and Gramineae. The grasses are considered as the highest development of the monocotyledons and in this scheme take pride of place over the Orchidaceae.

The attempt to place the orders and families in a strictly phylogenetic scheme and in sequence necessarily leads to some difficulties. An example may be mentioned, Araceae and their allies come between Liliaceae and Alstroemeriales on the one hand and Amaryllidaceae on the other.

In the determination of the phylogenetic lines of development a considerable amount of rearrangement of the plants has been undertaken. Genera are often regrouped, and in some cases families quite reconstituted.

Among the Corolliferae especially the author has rearranged the plants in a way that at first sight appears rather startling. The position of the ovary in the flower is not regarded as a character of first importance. The old, clear-cut distinction between forms with superior and with inferior ovaries is looked upon as an unnatural survival of the artificial Linnean system and certainly of much less value than habit, inflorescence form, and form of underground organs. To take an example, the Amaryllidaceae in their new guise are all plants with scapose umbellate inflorescences with one or more spathaceous bracts, and usually bulbous. Included are plants with both superior and inferior ovaries. The tribes Agapantheae, Allieae and some others from the old Liliaceae are included with the Amaryllidoideae. The Agavoideae and Hypoxoideae of the old Amaryllidaceae are excluded. The resultant family certainly seems to comprise a uniform and similar series of forms. It is perhaps unfortunate and liable to lead to confusion that the old name has to be retained for this quite new group.

A similar association of forms with superior and with inferior ovaries occurs elsewhere. The new family Agavaceae includes the Agavoideae and the Dracaenoideae with the genus Phormium.

Other families are also reconstituted. The Liliaceae have been reduced by the separation of some tribes or groups of specialised forms as separate families, among which are Roxburghiaceae, Xanthorrhoeaceae, Trilliaceae, Ruscaceae, and some others. The Liliaceae are left as plants with inflorescences never umbellate, regular flowers, and anthers opening by slits.

Of the new families, Ruscaceae contains the genera Ruscus, Semele and Danae. It is difficult to understand why these genera are separated while Asparagus is left in Liliaceae. If Asparagus were also included the new family would be a compact and characteristic group. The connate stamens alone form a separating character at present.

These are the most striking alterations. The others are for the most part necessitated by the rearrangements demanded by the phylogenetic scheme, and the usage of smaller units.

The order Farinosae as constituted by Engler, about which there has been a large amount of disagreement, has been much divided up. The greater part of the constituent families are placed in the Calyciferae, but the Pontederiaceae are closely associated with the Liliaceae. The Restionaceae are placed along with Juncaceae in the order Juncales in the Glumiflorae. This arrangement is open to criticism. The external similarities between Juncaceae and Restionaceae are striking, but on analysis seem rather such as might result from a parallel development and not real affinity. The differences in inflorescence, ovule, endosperm, and in leaf and stomata, together point to an absence of very close relationship.

Incidentally the statement that Restionaceae have flattened or quadrangular stems is one that reads strangely to anyone acquainted with the South African flora.

A consideration of the new arrangement and of the notes on it in various parts of the book gives the impression that the author has been guided in his conclusions by the general form of the plants and by what may be termed a " feeling " for affinity rather than by any study of the details of structure or morphology. In a large number of the new groups the results seem eminently satisfactory, but there are exceptions. In some cases the subdivision of orders or families might appear to have been adopted as a means of avoiding the need for associating plants that have been hitherto grouped together. The divisions of the Helobieae are a case in point.

The volume is certainly one deserving of careful study. While it does not seem at all probable that this system will represent the last word on phylogenetic classification of monocotyledons, in many ways it does clarify the current ideas on affinity, and it should undoubtedly act as a stimulus to further study along the lines of comparative morphology and phylogenetic relationships.

In this volume more details are given for the reasons for the departures from the older schemes of classification than was done in that on the dicotyledons. A very welcome addition is the inclusion of the characters of the tribes in the families and of brief keys to the genera. Unfortunately in the treatment of the large families Orchidaceae and Gramineae this is not done. In the grasses the genera in each tribe are listed, but no details are given for the orchids.

The book is well got up and printed. There are over 100 figures, most of which are clear and satisfactory, though in some of them the details are neither specially clear nor accurate. There are one or two slips that seem to be the result of haste in the final stages. The statement that Typha is absent from Africa south of the equator is one that certainly needs correction. There is a lack of agreement in Naiadaceae between the characters given in the key and those actually figured. These are, however, very minor points. The book is one of great interest and one that should be read and studied by anyone at all concerned with classification. Whether the reader feels inclined to accept Dr. Hutchinson's conclusions or not, he cannot fail to obtain interest and stimulation.

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The Life-Forms of Plants and Statistical Plant Geography, being the Collected Papers of C. Raunkiaer. Oxford : Clarendon Press. 1934. 35s. net, pp. xvi and 632, figs. 189 (photos 93, text 96).

The life-form of a plant was one of the earliest characters chosen as a basis for classification. With the appearance of the work of Linnaeus and the focussing of attention on flower structure it was overshadowed for a long period, but during the last thirty years, with the spread of ecological interests, the importance of plant form and its relationships to climate have again become prominent.

Of the numerous schemes of classification of life-forms that have been put forward that which has received the most general acceptance and which has been much the most generally applied has been the scheme devised by Raunkiaer for the first time in 1903.

Raunkiaer's original work was, for the most part, published in Danish and in Danish periodicals, and hence has not been very generally available to botanists in other countries. One result has been that his classification of life-forms, which was not only formulated but also tested, has been used by many workers who did not obtain their knowledge from the original sources, but had to rely on short summaries published in other languages. The present writer must admit to being one of these. This has resulted in the overlooking of much of Raunkiaer's work, and unfortunately in the spreading of some misconceptions or misapplications of his views. The publication of this volume, which contains translations of Raunkiaer's papers into English, will render the sources of information generally available and should counteract the misconceptions that have arisen. It will come as a real boon to botanists generally.

The papers included in this volume are arranged chronologically in 17 chapters and cover the period from 1903 to the present. There is also one which has not previously been published.

This sequence of papers is of great interest in many ways. It brings out clearly the growth and development of Raunkiaer's concepts and also demonstrates the wide outlook on plant geography that the author possesses.

The first chapter gives Raunkiaer's original communication on life-forms and the first form of the scheme. The second is a translation of the book in which the scheme was elaborated and its value for plant geography set out. This is illustrated by a number of excellent drawings showing the essential characters of the various groups of life-form. The inclusion among these of drawings of *Cunonia*, *Pelargonium*, *Babiana*, *Tritonia*, *Gladiolus*, and *Crassula* will help to bring the scheme vividly to a South African and assist in demonstrating its quite general application.

In this chapter the relations of rainfall and temperature, which are the dominating factors in climate as it affects plants, are illustrated by " hydrotherm charts," in which Raunkiaer combined the two factors in one graphic representation.

The correlation of the distribution of life-forms with climate which was commenced in this book was followed up later by a series of papers which form Chapters 4, 5, 7, 8, 9, 12 and 17 of the present book. These deal with a variety of climates and various stages of vegetation. In them the value of life-form distribution as an indicator of climate is fully demonstrated. The distribution is shown to hold both for established vegetation and for pioneer plants on new soils. In Chapter 4 is introduced the conception of a " normal " distribution or " normal spectrum," as it is termed, which can serve as a basis of comparison for any given climate. The concept is followed up and elaborated in Chapter 12.

In Chapter 10 a further aspect of life-form is dealt with. This is leaf-size, which bears such a definite relation to climate. The classification here set out forms an addition to and extension of the general classification of life-forms.

Raunkiaer's work, however, is by no means confined to the classification of life-forms and its applications. He was one of the pioneer workers who set out to obtain quantitative data on the distribution of species within a community and between communities. The concepts of " frequency " and of " areal percentage " are due to him.

The papers here translated deal with his methods and results, and mark the starting point of the statistical method in studies in plant sociology which has been pursued with such vigour since, especially by the European workers. The introduction of these quantitative methods by Raunkiaer has done more than anything else to raise descriptive plant geography to the position of a definite science. Previously, descriptions of the composition of plant communities were vague and very much dependent on the personal factor in the observer. The statistical aspects are dealt with in Chapters 4, 8, 11, 16, and 17.

In addition, there are papers dealing with soil acidity and its relation to vegetation (Chap. 14) and detailed studies of single plants (Chaps. 3 and 15).

While much of the work carried out in demonstrating and elaborating the ideas put forward by Raunkiaer was carried out on the vegetation of the cooler and even arctic regions of the northern hemisphere, this is by no means always the case. Moist tropical climates are treated and also the Mediterranean climate, which in many ways is so similar to that of the south-western Cape.

However, the basal concepts are universal in their application, and the treatment is so clear that, in spite of the sometimes unfamiliar examples that are chosen as illustrations, the interest and importance of the contributions must be apparent to anyone interested in plant geography.

The issue of the volume originated with a committee in Denmark who felt that the work of Raunkiaer had not received the attention its intrinsic importance deserved, largely owing to language difficulties and to the relative inaccessibility of some of the publications in which it appeared. All botanists must be grateful to them and to the Clarendon Press for producing the present volume, which renders the work so easily accessible.

The translation has been carried out in the main by H. Gilbert-Carter. Two of the papers are translated by Professor A. G. Tansley and one by Miss A. Fausbøll. Professor Tansley has acted as general editor and contributes an introduction. These persons must be congratulated on their work. The book as a whole does not read like a translation. The papers have been translated literally as far as possible and left to speak for themselves. Very wisely no editorial notes or comments have been introduced.

The book is printed in the excellent manner associated with the name of the Clarendon Press and is very fully illustrated. Both the line drawings and the numerous photographs are of excellent quality and very well reproduced.

The volume is one that should be read and studied by all botanists, and most assuredly no botanical library can afford to be without it.

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